A STUDY OF SPOTTED OWL DEMOGRAPHICS IN THE SIERRA NATIONAL FOREST AND SEQUOIA AND KINGS CANYON NATIONAL PARKS

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A STUDY OF SPOTTED OWL DEMOGRAPHICS IN THE SIERRA NATIONAL FOREST AND SEQUOIA AND KINGS CANYON NATIONAL PARKS

by

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INTRODUCTION

This report summarizes key activities and preliminary results of demographic studies of spotted owls in the Sierra National Forest (SNF) and the Sequoia/Kings Canyon National Parks (SNP) for 1991 and 1992. The demographic studies were initiated in March of 1990 and will allow comparisons between spotted owl demographics in a managed National Forest and protected forests of the National Park.

OBJECTIVES

1. Estimate densities of spotted owls and occupancy status of owl territories in the designated study areas.
2. Estimate vital rates (reproduction, mortality), by age class.
3. Assess site fidelity among individual spotted owls.
4. Estimate turnover rates (reoccupation of territories vacated during the study).
5. Quantify the distribution of vegetative habitats within the study areas.
6. Characterize diets of spotted owls from regurgitated pellets, and compare diets of breeding and nonbreeding pairs during the breeding period (1 March to 30 September).

STUDY AREA

Boundaries of study areas were delineated on major topographic features such as ridges, drainages (major rivers), and administrative boundaries (eg. Sequoia and Kings Canyon National Parks boundaries). The SNF study area covers 161 mi^2 and the SNP study area covers 130 mi^2. Three vegetative types, oak woodland (1,000 to 4,000 feet), mid-elevation coniferous forest(4,000 to 8,000 feet) and high elevation coniferous forest (8,000 to 9,600 feet) are found in both study areas. A detailed description of these vegetation types and the area they occupy can be found in the 1990 annual report (Verner et al. 1990).

METHODS

We attempted to locate, capture and color band all spotted owls within both study areas. Spotted owls were located by night and day calling surveys using vocal imitations of spotted owls to elicit responses. The methods of survey included point surveys, leap frog road surveys, and walking cruise surveys.

The protocol for surveying, determining social status, nesting status and reproductive status can be found in Verner et al. (1990). In general, regardless of study area or year, we attempted to apply equal survey effort. Conditions that may have influenced survey effort were inclement weather conditions, such as high winds or steady rain, and water noise when surveying drainages.

RESULTS

SURVEY

Calling surveys for 1991 and 1992 began in both study areas in the first week of March and ended on 30 September. Both study areas were divided in smaller subdivision or sites and then an attempt was made to survey all sites within the

study areas six times regardless of vegetation type, slope, aspect, or elevation. Total coverage (six full surveys in all sites) remained incomplete for both study areas.

DETECTION AND CAPTURE

A summary of the social status of owls in the SNF is reported in table 1a, and sex and age class distributions are reported in table 2a. Adult and subadult numbers between 1991 and 1992 differed by only three, but the number of juveniles produced jumped from seven in 1991 to 53 in 1992. Fifteen adults and subadults (8 males and 7 females) were captured and banded in 1991 and 13 (6 males and 7 females) in 1992. In 1991 five of the seven juveniles were banded and in 1992, 52 of the 53 juveniles were banded. Seventy-one juveniles have been banded on the SNF study area to date. Only two juveniles, both banded in 1990, have been located within the study area, a male found in 1991 and a female found in 1992.

The summary of the social status of owls in the SNP is reported in table 1b, and sex and age class distributions are reported in table 2b. Sixty adults and subadults were found in 1991 and 1992, but the number of juveniles went from one in 1991 to 43 in 1992. In 1991 11 adults and subadults (5 males and 6 females) were banded, while in 1992, 19 owls (8 males and 11 females) were banded. The single juvenile from 1991 was captured and banded and 35 juveniles in 1992 were banded. In 1992 one subadult was identified by its cohort band as having been banded as a juvenile in 1990, but it was not recaptured so its natal area is unknown.

DENSITY

Spotted owl density estimates for both study areas are reported in table 3. The study areas were selected for their similarities in elevation, habitat types, and geographical location; thus, the crude densities (based on the total number of adult and subadult owls divided by the area of the study site) can be compared.

MISSING, REPLACED AND MOVEMENT

Turnover events included owls that were missing, were replaced, or had moved from one site to another. Totals were derived from banded owls only. Data for the SNF is reported in table 4a (1990-1991) and table 4b (1991-1992). For 1990-1991 there were 35 banded owls with confirmed status (either present or a turnover event). Twenty-seven owls were present, six owls were confirmed missing and replaced and two moved to new sites. In 1991-1992 there were 46 banded owls with confirmed status, 35 present, seven missing of which six were replaced, and four movements. The empirical relocation rate, or the number of banded owls relocated each year from previous year was 83% for 1991 and 85% for 1992 (Tables 5a and 5b).

Missing, replaced, and movement data for the SNP is reported in table 6a (1990-1991) and table 6b (1991-1992). In 1990-1991 there were 25 banded owls with confirmed status, of which, 17 were present, seven were missing with six replaced, and one movement. In 1991-1992 there were 37 banded owls with confirmed status. Twenty-seven were present, seven missing and three moved. Six of the missing owls and two of the owls that moved were replaced. The empirical relocation rate was 72% for 1991 and 81% for 1992 (Tables 7a and 7b).

REPRODUCTION AND NESTING ATTEMPTS

The proportion of owl pairs nesting on the SNF, as determined by protocol, was 67% for 1991 and 90% for 1992 (Table 8a). The proportion of owls checked for reproduction by July 15, which fledged young, was 39% for 1991 and 87% for 1992 (Table 9a) and the number of young fledged per pair that were checked for reproduction was 0.46 in 1991 and 1.73 in 1992 (Table 10a). The average number of young fledged per successful reproductive pair was 1.20 in 1991 and 2.00 in 1992 (Table 11a).

In the SNP the proportion of owl pairs nesting as determined by protocol was 18% for 1991 and 89% for 1992 (Table 8b). The proportion of owls checked for reproduction by July 15, that fledged young, was 8% for 1991 and 85% for 1992 (Table 9b) and the number of young fledged per pair checked for reproduction was 0.08 for 1991 and 1.59 for 1992 (Table 10b). The average number of young fledged per successful reproductive pair was 1.00 for 1991 and 1.87 for 1992 (Table 11b).

DISCUSSION

Findings of particular interest were the low proportion of pairs nesting on the SNP, and the proportion of pairs checked for reproduction which fledged young in both study areas in 1991. The cause of the low reproductive rates are unknown at this time, although both study areas did receive heavy rainfall in March, 1991 at the time of egg laying and nesting.

LITERATURE CITED

Verner, Jared, G. N. Steger, G. P. Eberlein D. A. Leal, and T. E. Munton. 1991. Part 1: Spotted Owl home-range size and composition in the Sierra National Forest. Part 2: Demography of spotted owls in the Sierra National Forest and Sequoia/Kings Canyon National Parks. Annual Progress Report 1990. Internal Report, Pacific Southwest Forest and Range Experiment Station, Fresno, California. 9 pp.

TABLE 1a. Summary of social status of California spotted owls on the Sierra National Forest, 1990, 1991, and 1992.

SOCIAL STATUS	1990	1991	1992
ADULT AND SUBADULT			
PAIR	31	26	32
SINGLE MALE	0	3	1
SINGLE FEMALE	0	0	1
MALE & FEMALE PRESENT	4	0	1
MALE PRESENT	11	7	0
FEMALE PRESENT	6	4	1
TOTAL NUMBER OF OWLS	87	66	69
JUVENILES	21	7	53

TABLE 1b. Summary of social status of California spotted owls on the Sequoia Kings Canyon National Parks, 1990, 1991, and 1992.

SOCIAL STATUS	1990	1991	1992
ADULT AND SUBADULT			
PAIR	22	23	27
SINGLE MALE	0	0	0
SINGLE FEMALE	0	1	0
MALE & FEMALE PRESENT	2	5	0
MALE PRESENT	5	1	5
FEMALE PRESENT	1	0	0
UNKNOWN PRESENT	0	2	1
TOTAL NUMBER OF OWLS	54	60	60
JUVENILES	21	1	45

Table 2a. Sex and age class distribution of California spotted owls identified to age class on the Sierra National Forest, 1990, 1991, and 1992.

		1990		1991		1992	
Sex	Age Class	N	%	N	%	N	%
Male	Adult	23	79.3	27	87.1	27	87.1
	Subadult	6	20.7	4	12.9	4	12.9
	Combined	29	100.0	31	100.0	31	100.0
Female	Adult	21	84.0	28	100.0	31	96.9
	Subadult	4	16.0	0	0.0	1	3.1
	Combined	25	100.0	28	100.0	32	100.0
Both	Adult	44	81.5	55	93.2	58	92.1
	Subadult	10	8.5	4	6.8	5	7.9
	Combined	54	100.0	59	100.0	63	100.0

Table 2b. Sex and age class distribution of California spotted owls identified to age class on the Sequoia Kings Canyon National Parks, 1990, 1991 and 1992.

		1990		1991		1992	
Sex	Age Class	N	%	N	%	N	%
Male	Adult	21	95.5	23	95.8	24	92.3
	Subadult	1	4.5	1	4.2	2	7.7
	Combined	22	100.0	24	100.0	26	100.0
Female	Adult	19	90.5	20	90.9	25	96.2
	Subadult	2	9.5	2	9.1	1	3.8
	Combined	21	100.0	22	100.0	26	100.0
Both	Adult	40	93.0	43	93.5	49	94.2
	Subadult	3	7.0	3	6.5	3	5.8
	Combined	43	100.0	46	100.0	52	100.0

TABLE 3.

CRUDE DENSITY

Mean crude density estimates (n per mi^2) for California Spotted Owls on the Sierra National Forest and Sequoia and Kings Canyon National Parks Study Areas, from 1990 through 1992. Crude density was calculated by dividing the number of owls detected by the number of square miles in each study area.

	SIERRA STUDY AREA			SEQUOIA/KINGS STUDY AREA		
YEAR	TOTAL AREA	OWLS DETECTED	CRUDE DENSITY	TOTAL AREA	OWLS DETECTED	CRUDE DENSITY
1990	160.4	87	0.542	130.0	54	0.415
1991	160.4	66	0.411	130.0	60	0.461
1992	160.4	69	0.430	130.0	60	0.461

TABLE 4a. Missing, replaced and inter-site movement rates for banded California spotted owls on the Sierra National Forest between 1990 and 1991.

Sex	Age Class	No. Banded 1990	MISSING N	MISSING %	REPLACED N	REPLACED %	MOVEMENT N	MOVEMENT %
Male	Adult	15	4	0.27	4	0.27	1	0.07
	Subadult	4	1	0.25	1	0.25	0	0.00
	Total	19	5	0.26	5	0.26	1	0.05
Female	Adult	15	1	0.07	1	0.07	1	0.07
	Subadult	1	0	0.00	0	0.00	0	0.00
	Total	16	1	0.06	1	0.07	1	0.06
Both	Adult	30	5	0.17	5	0.17	2	0.07
	Subadult	5	1	0.20	1	0.20	0	0.00
	Combined	35	6	0.17	6	0.17	2	0.06

TABLE 4b. Missing, replaced and inter-site movement rates for banded California spotted owls on the Sierra National Forest between 1991 and 1992.

Sex	Age Class	No. Banded 1991	MISSING N	MISSING %	REPLACED N	REPLACED %	MOVEMENT N	MOVEMENT %
Male	Adult	21	4	0.19	3	0.19	2	0.10
	Subadult	2	0	0.00	0	0.00	1	0.05
	Total	23	4	0.17	3	0.13	3	0.14
Female	Adult	23	3	0.13	3	0.13	2	0.09
	Subadult	0	0	0.00	0	0.00	0	0.00
	Combined	23	3	0.13	3	0.13	2	0.09
Both	Adult	44	7	0.16	6	0.14	4	0.09
	Subadult	2	0	0.00	0	0.00	0	0.00
	Combined	46	7	0.15	6	0.13	4	0.09

TABLE 5a. Empirical relocation rates of California spotted owls on the Sierra National Forest between 1990 and 1991.

Sex	Age Class	No. Banded 1990	RELOCATED N	RELOCATED Percent
Male	Adult	15	11	0.73
	Subadult	4	3	0.75
	Total	19	14	0.74
Female	Adult	15	14	0.93
	Subadult	1	1	1.00
	Combined	16	15	0.94
Both	Adult	30	25	0.83
	Subadult	5	4	0.80
	Combined	35	29	0.83

TABLE 5b. Empirical relocation rates of California spotted owls on the Sierra National Forest between 1991 and 1992.

Sex	Age Class	No. Banded 1991	RELOCATED N	RELOCATED Percent
Male	Adult	21	17	0.81
	Subadult	2	2	1.00
	Total	23	19	0.83
Female	Adult	23	20	0.87
	Subadult	0	0	0.00
	Combined	23	20	0.87
Both	Adult	44	37	0.84
	Subadult	2	2	1.00
	Combined	46	39	0.85

TABLE 6a. Missing, replaced and inter-site movement rates for banded California spotted owls on the Sequoia Kings Canyon National Parks between 1990 and 1991.

Sex	Age Class	No. Banded 1990	MISSING N	MISSING %	REPLACED N	REPLACED %	MOVEMENT N	MOVEMENT %
Male	Adult	10	1	0.10	1	0.10	0	0.00
	Subadult	1	0	0.00	0	0.00	1	1.00
	Total	11	1	0.09	1	0.09	1	0.09
Female	Adult	13	6	0.46	5	0.38	0	0.00
	Subadult	1	0	0.00	0	0.00	0	0.00
	Combined	14	6	0.43	5	0.36	0	0.00
Both	Adult	23	7	0.30	6	0.26	0	0.00
	Subadult	2	0	0.00	0	0.00	1	0.50
	Combined	25	7	0.28	6	0.24	1	0.04

TABLE 6b. Missing, replaced and inter-site movement rates for banded California spotted owls on the Sequoia Kings Canyon National Parks between 1991 and 1992.

Sex	Age Class	No. Banded 1991	MISSING N	MISSING %	REPLACED N	REPLACED %	MOVEMENT N	MOVEMENT %
Male	Adult	20	4	0.20	4	0.20	1	0.05
	Subadult	0	0	0.00	0	0.00	0	0.00
	Total	20	4	0.20	4	0.20	1	0.05
Female	Adult	16	3	0.19	4	0.25	1	0.06
	Subadult	1	0	0.00	0	0.00	1	1.00
	Combined	17	3	0.18	4	0.24	2	0.12
Both	Adult	36	7	0.19	8	0.22	2	0.06
	Subadult	1	0	0.00	0	0.00	1	1.00
	Combined	37	7	0.19	8	0.22	3	0.08

TABLE 7a. Empirical relocation rates of California spotted owls on the Sequoia Kings Canyon National Parks between 1990 and 1991.

Sex	Age Class	No. Banded 1990	RELOCATED N	RELOCATED Percent
Male	Adult	10	9	0.90
	Subadult	1	1	1.00
	Total	11	10	0.91
Female	Adult	13	7	0.54
	Subadult	1	1	1.00
	Combined	14	8	0.57
Both	Adult	23	16	0.70
	Subadult	2	2	1.00
	Combined	25	18	0.72

Two adult females which were identified in 1989 but not in 1990 were verified ss replaced in 1991. They are not included in the above table.

This table includes an adult female that was missing (but not replaced) after a complete survey of its historic site.

Age=previous year

TABLE 7b. Empirical relocation rates of California spotted owls on the Sequoia Kings Canyon National Parks between 1991 and 1992.

Sex	Age Class	No. Banded 1991	RELOCATED N	RELOCATED Percent
Male	Adult	20	16	0.80
	Subadult	0	0	0.00
	Total	20	16	0.80
Female	Adult	16	13	0.81
	Subadult	1	1	1.00
	Combined	17	14	0.82
Both	Adult	36	29	0.81
	Subadult	1	1	1.00
	Combined	37	30	0.81

TABLE 8a. Proportion of California spotted owl pairs nesting on the Sierra National Forest, 1990, 1991, and 1992.

	PAIRS CHECKED FOR NESTING	PAIRS NESTING	PROPORTION NESTING
YEAR	N	N	Percent
1990	8	5	0.63
1991	9	6	0.67
1992	30	27	0.90

TABLE 8b. Proportion of California spotted owl pairs nesting on the Sequoia Kings Canyon National Parks, 1990, 1991, and 1992.

	PAIRS CHECKED FOR NESTING	PAIRS NESTING	PROPORTION NESTING
YEAR	N	N	Percent
1990	5	4	0.80
1991	11	2	0.18
1992	27	24	0.89

TABLE 9a. Proportion of pairs of California spotted owls checked for reproduction by 15 July which fledged young on the Sierra National Forest, 1990, 1991, and 1992.

YEAR	No. Pairs Checked	No. Pairs Which Fledged Young	Proportion of All Pairs Checked Which Fledged Young
1990	18	13	0.72
1991	13	5	0.39
1992	30	26	0.87

TABLE 9b. Proportion of pairs of California spotted owls checked for reproduction by 15 July which fledged young on the Sequoia Kings Canyon National Parks, 1990, 1991, and 1992.

YEAR	No. Pairs Checked	No. Pairs Which Fledged Young	Proportion of All Pairs Checked Which Fledged Young
1990	8	7	0.88
1991	12	1	0.08
1992	27	23	0.85

TABLE 10a. Mean number of young fledged per pair of California spotted owls checked for reproduction by 15 July on the Sierra National Forest, 1990, 1991, and 1992.

YEAR	No. Pairs Checked	Number of Young Found	Mean Number of Young Per Pair
1990	18	22	1.22
1991	13	6	0.46
1992	30	52	1.73

Table 10b. Mean number of young fledged per pair of California spotted owls checked for reproduction by 15 July on the Sequoia Kings Canyon National Parks, 1990, 1991, and 1992.

YEAR	No. Pairs Checked	Number of Young Found	Mean Number of Young Per Pair
1990	8	12	1.50
1991	12	1	0.08
1992	27	43	1.59

TABLE 11a. Mean number of young fledged per pair of California spotted owls that fledged young on the Sierra National Forest, 1990, 1991, and 1992.

YEAR	No. Pairs Checked	No. Fledged Young	Mean Number of Young Fledged Per Pair
1990	13	22	1.69
1991	5	6	1.20
1992	26	52	2.00

TABLE 11a. Mean number of young fledged per pair of California spotted owls that fledged young on the Sequoia Kings Canyon National Parks, 1990, 1991, and 1992.

YEAR	No. Pairs Checked	No. Fledged Young	Mean Number of Young Fledged Per Pair
1990	7	12	1.71
1991	1	1	1.00
1992	23	43	1.87